APPENDIX A

GLOSSARY

This page intentionally left blank.

GLOSSARY

Adsorption - Adherence of molecules in solution to the surface of solids.

Adsorption isotherm - The relationship between the concentration of constituent in solution and the amount adsorbed at constant temperature.

Advection - The process whereby solutes are transported by the bulk mass of flowing fluid.

Alluvium - The general name for all sediments, including clay, silt, sand, gravel or similar unconsolidated material deposited in a sorted or semi-sorted condition by a stream or other body of running water, in a stream bed, floodplain, delta or at the base of a mountain slope as a fan.

Anisotropy - The condition of having different properties in different directions.

Aquifer - A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Aquifer system - A body of permeable material that functions regionally as a water-yielding unit; it comprises two or more permeable beds separated at least locally by confining beds that impede ground-water movement but do not greatly affect the regional hydraulic continuity of the system; includes both saturated and unsaturated parts of permeable material.

Area of influence of a well - The area surrounding a pumping or recharging well within which the potentiometric surface has been changed.

Breakthrough curve - A graph of concentration versus time at a fixed location.

Cancer slope factor (CFS) - An upper bound estimate, approximating a 95% confidence limit, on the increased cancer risk from a lifetime exposure to an agent. This estimate, usually expressed in units of proportion (of a population) affected per mg/kg/day, is generally reserved for use in the low-dose region of the dose-response relationship, that is, for exposures corresponding to risks less than 1 in 100.

Cation exchange capacity - The sum total of exchangeable cations that a porous medium can absorb. Expressed in moles of ion charge per kilogram of soil.

Chronic daily intake (CDI) - Exposure expressed as mass of a substance contacted per unit body weight per unit time, averaged over a long period of time.

Confined - A modifier that describes a condition in which the potentiometric surface is above the top of the aquifer.

Confined aquifer - An aquifer bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself; an aquifer containing confined ground water.

Confining unit - A body of impermeable or distinctly less permeable material which separates water-bearing layers.

Darcian velocity - The rate of ground-water flow per unit area of porous or fractured media measured perpendicular to the direction of flow. See specific discharge.

Darcy's law - An empirical law which states that the velocity of flow through porous medium is directly proportional to the hydraulic gradient.

Desorption - Removal of a substance adsorbed to the surface of an adsorbent. Also, the reverse process of sorption.

Diffusion - Spreading of solutes from regions of higher concentration to regions of lower concentration caused by the concentration gradient. In slow-moving ground water, this can be a significant mixing process.

Diffusion coefficient - The rate at which solutes are transported at the microscopic level due to variations in the solute concentrations within the fluid phases.

Dispersion coefficient - A measure of the tendency of a plume of dissolved constituents in ground water to spread. Equal to the sum of the coefficients of mechanical dispersion and molecular diffusion in a porous medium.

Dispersion, longitudinal - Process whereby some of the water molecules and solute molecules travel more rapidly than the average linear velocity and some travel more slowly. Results in the spreading of the solute in the direction of the bulk flow.

Dispersion, transverse - Process whereby some of the water molecules and solute molecules spread in directions perpendicular to the bulk flow.

Dispersivity - A geometric property of a porous medium that determines the dispersion characteristics of the medium by relating the components of pore velocity to the dispersion coefficient.

Distribution coefficient - The quantity of a constituent sorbed by a solid per unit weight of solid divided by the quantity dissolved in water per unit volume of water.

Dose-response relationship - The relationship between a quantified exposure (dose), and the proportion of subjects demonstrating specific, biological changes (response).

Evapotranspiration - The combined loss of water from a given area by evaporation from the land and transpiration from plants.

Exposure pathway - The course a chemical or physical agent takes from a source to an exposed organism. An exposure pathway describes a unique mechanism by which an individual or population is exposed to chemicals or physical agents at, or originating from, a site. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source, transport/exposure medium (e.g., water) or media (in case of intermedia transfer) also is included.

Exposure point - A location of potential contact between an organism and a chemical or physical agent.

Exposure point concentration - an estimate of the of the arithmetic average concentration of a contaminant at a exposure point.

Flow, steady - A characteristic of a flow system where the magnitude and direction of specific discharge are constant in time at any point. See also flow, unsteady.

Flow, uniform - A characteristic of a flow system where specific discharge has the same magnitude and direction at any point.

Flow, unsteady - A characteristic of a flow system where the magnitude and/or direction of the flow rate changes with time.

Flow velocity - The rate of ground-water flow per unit area of porous or fractured media measured perpendicular to the direction of flow. See specific discharge.

Flux - The rate of ground-water flow per unit area of porous or fractured media measured perpendicular to the direction of flow. See specific discharge.
Fracture - A break or crack in the bedrock.

Geohydrologic system - The geohydrologic units within a geologic setting, including any recharge, discharge, interconnections between units, and any natural or human-induced processes or events that could affect ground-water flow within or among those units. See ground-water system.

Geohydrologic unit - An aquifer, a confining unit, or a combination of aquifers and confining units comprising a framework for a reasonably distinct geohydrologic system. See hydrogeologic unit.

Ground water - Water present below the land surface in a zone of saturation. Ground water is the water contained within an aquifer.

Ground water, confined - Ground water under pressure significantly greater than atmospheric and whose upper limit is the bottom of a confining unit.

Ground-water discharge - Flow of water out of the zone of saturation.

Ground-water flow - The movement of water in the zone of saturation.

Ground-water flux - The rate of ground-water flow per unit area of porous or fractured media measured perpendicular to the direction of flow. See specific discharge.

Ground-water mound - A raised area in a water table or potentiometric surface created by ground-water recharge.

Ground-water recharge - The process of water addition to the saturated zone or the volume of water added by this process.

Ground-water system - A ground-water reservoir and its contained water. Also, the collective hydrodynamic and geochemical processes at work in the reservoir.

Ground-water table - That surface below which rock, gravel, sand or other material is saturated. It is the surface of a body of unconfined ground water at which the pressure is atmospheric. Also called water table; synonymous with phreatic surface.

Ground-water travel time - The time required for a unit volume of ground water or solute to travel between two locations. The travel time is the length of the flow path divided by the pore water velocity. If discrete segments of the flow path have different hydrologic properties, the total travel time will be the sum of the travel times for each discrete segment.

Ground water, unconfined - Water in an aquifer that has a water table. See also ground water, confined.

Hazard quotient - The ratio of a single contaminant exposure level over a specified time period to a reference dose for that contaminant derived from a similar period.

Health-based number (HBN) - The maximum constituent concentration in ground water that is expected to not usually cause adverse noncancer health effects in the general population (including sensitive subgroups), or that will not result in an additional incidence of cancer in more than approximately one in one million individuals exposed to the contaminant.

Heterogeneity - A characteristic of a medium in which material properties vary throughout the medium.

Homogeneity - A characteristic of a medium in which material properties are identical throughout the medium.

Hydraulic conductivity - A coefficient of proportionality describing the rate at which water can move through an aquifer or other permeable medium. Synonymous with permeability.

Hydraulic gradient - Slope of the water table or potentiometric surface.

Hydraulic head - The level to which water rises in a well with reference to a datum such as sea level.

Hydrodynamic dispersion - The spreading of the solute front during ground-water plume transport resulting from both mechanical dispersion and molecular diffusion. Synonymous with mechanical dispersion.

Hydrogeologic unit - Any soil or rock unit or zone that by virtue of its porosity or permeability, or lack thereof, has a distinct influence on the storage or movement of ground water.

Hydrologic properties - Those properties of a rock that govern the entrance of water and the capacity to hold, transmit, and deliver water. Hydrologic properties include porosity, effective porosity, and permeability.

Hydrolysis - The splitting (lysis) of a compound by a reaction with water. Example are the reaction of salts with water to produce solutions that are not neutral, and the reaction of an ester with water.

Hydrostratigraphic unit - See hydrogeologic unit.

Igneous rocks - Rocks that solidified from molten or partly molten materials, that is from a magma or lava.

Immiscible - The chemical property of two or more phases that, at mutual equilibrium, cannot dissolve completely in one another, for example, oil and water.

Impermeable - A characteristic of some geologic material that limits its ability to transmit significant quantities of water under the head differences ordinarily found in the subsurface.

Infiltration - The downward entry of water into the soil or rock, specifically from a waste management unit.

Isotropy - The condition in which the property or properties of interest are the same in all directions.

Leachate - A liquid that has percolated through waste and has extracted dissolved or suspended materials.

Leaching - Separation or dissolving out of soluble constituents from a waste by percolation of water.

Matrix - The solid particles in a porous system and their spatial arrangement. Often used in contrast to the pore space in a porous system.

Matrix diffusion - The tendency of solutes to diffuse from the larger pores in the system into small pores inside the solid matrix from where they can be removed only very slowly.

Maximum Contaminant Level (MCL) - Legally enforceable standards regulating the maximum allowed amount of certain chemicals in drinking water.

Mechanical dispersion - The process whereby solutes are mechanically mixed during advective transport caused by the velocity variations at the microscopic level. Synonymous with hydrodynamic dispersion.

Metamorphic rocks - Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, essentially in the solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment, generally at depth in the Earth's crust.

Miscible - The chemical property of two or more fluid phases that, when brought together, have the ability to mix and form one phase.

Model - A simplified representation of a physical system obeying certain specified conditions, whose behavior is used to understand the real world system. Often, the model is a mathematical representation, programmed into a computer.

Moisture content - The ratio of either (a) the weight of water to the weight of solid particles expressed as moisture weight percentage or (b) the volume of water to the volume of solid particles expressed as moisture volume percentage in a given volume of porous medium. See water content.

Molecular diffusion - The process in which solutes are transported at the microscopic level due to variations in the solute concentrations within the fluid phases. See diffusion.

Monte Carlo simulation - A method that produces a statistical estimate of a quantity by taking many random samples from an assumed probability distribution, such as a normal distribution. The method is typically used when experimentation is infeasible or when the actual input values are difficult or impossible to obtain.

Mounding - Commonly, an outward and upward expansion of the free water table caused by surface infiltration or recharge.

Outwash deposits - Stratified drift deposited by meltwater streams flowing away from melting ice.

Overburden - The layer of fragmental and unconsolidated material including loose soil, silt, sand and gravel overlying bedrock, which has been either transported from elsewhere or formed in place.

Permeability - The property of a porous medium to transmit fluids under an hydraulic gradient.

Permeable - The property of a porous medium to allow the easy passage of a fluid through it.

pH - A numerical measure of the acidity or alkalinity of water ranging from 0 to 14. Neutral waters have pH near 7. Acidic waters have pH less than 7 and alkaline waters have pH greater than 7.

Pore-water velocity - Average velocity of water particles. Equals the Darcian velocity divided by the effective porosity. Synonymous with seepage velocity.

Porosity - The ratio, usually expressed as a percentage, of the total volume of voids (or pores) of a given porous medium to the total volume of the porous medium.

Porosity, effective - The ratio, usually expressed as a percentage, of the total volume of voids (or pores) available for fluid transmission to the total volume of the porous medium.

Receptor - The potentially exposed individual for the exposure pathway considered.

Recharge - The process of addition of water to the saturated zone; also the water added. In IWEM, recharge is the result of natural precipitation around a waste management unit.

Reference concentration (RfC) - An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used. Generally used in EPA's noncancer health assessments.

Reference Dose (RfD) - An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral or dermal exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

Retardation factor - The ratio of the average linear velocity of ground water to the velocity of a dissolved constituent. A value greater than one indicates that the constituent moves more slowly than water, usually caused by sorption.

Risk - The probability that a constituent will cause an adverse effect in exposed humans or to the environment.

Risk assessment - The process used to determine the risk posed by contaminants released into the environment. Elements include identification of the contaminants present in the environmental media, assessment of exposure and exposure pathways, assessment of the toxicity of the contaminants present at the site, characterization of human health risks, and characterization of the impacts or risks to the environment.

Saturated Zone - The part of the water bearing layer of rock or soil in which all spaces, large or small, are filled with water.

Sedimentary rocks - Rocks formed from consolidation of loose sediments such as clay, silt, sand, and gravel.

Seepage velocity - See pore-water velocity.

Soil bulk density - The mass of dry soil per unit bulk soil.

Soil moisture - Subsurface liquid water in the unsaturated zone expressed as a fraction of the total porous medium volume occupied by water. It is less than or equal to the porosity.

Solubility - The total amount of solute species that will remain indefinitely in a solution maintained at constant temperature and pressure in contact with the solid crystals from which the solutes were derived.

Solute transport - The net flux of solute (dissolved constituent) through a hydrogeologic unit controlled by the flow of subsurface water and transport mechanisms.

Sorption - A general term used to encompass the process of adsorption.

Source term - The kinds and amounts of constituents that make up the source of a potential release.

Specific discharge - The rate of discharge of ground water per unit area of a porous medium measured at right angle to the direction of flow. Synonymous with Darcian velocity, or (specific) flux.

Till - Till consists of a generally unconsolidated, unsorted, unstratified heterogeneous mixture of clay, silt, sand, gravel and boulders of different sizes and shapes. Till is deposited directly by and underneath glacial ice without subsequent reworking by meltwater.

Toxicity - The degree to which a chemical substance elicits a deleterious or adverse effect on a biological system of an organism exposed to the substance over a designated time period.

Transient flow - See flow, unsteady.

Transmissivity - The rate at which water is transmitted through a unit width of the aquifer under a unit hydraulic gradient. It is equal to an integration of the hydraulic conductivities across the saturated part of the aquifer perpendicular to the flow paths.

Transport - Conveyance of dissolved constituents and particulates in flow systems. See also solute transport.

Unconfined - A condition in which the upper surface of the zone of saturation forms a water table under atmospheric pressure.

Unconfined aquifer - An aquifer that has a water table.

Unconsolidated deposits - Deposits overlying bedrock and consisting of soil, silt, sand, gravel and other material which have either been formed in place or have been transported in from elsewhere.

Unsaturated flow - The movement of water in a porous medium in which the pore spaces are not filled to capacity with water.

Unsaturated zone - The subsurface zone between the water table and the land surface where some of the spaces between the soil particles are filled with air.

Vadose zone - See unsaturated zone.

Volatiles - Substances with relatively large vapor pressures that easily volatilize when in contact with air.

Water content - The amount of water lost from the soil after drying it to constant weight at 105 °C, expressed either as the weight of water per unit weight of dry soil or as the volume of water per unit bulk volume of soil. See also moisture content.

Water table - The upper surface of a zone of saturation except where that surface is formed by a confining unit. The water pressure at the water table equals atmospheric pressure.

Water table aquifer - See unconfined aquifer.

Well - A bored, drilled or driven shaft, or a dug hole extending from the ground surface into the ground water, that is used to inject (injection well) or extract ground water.
Well screen - A cylindrical filter used to prevent sediment from entering a water well. There are several types of well screens, which can be ordered in various slot widths, selected on the basis of the grain size of the aquifer material where the well screen is to be located. In very fine grained aquifers, a zone of fine gravel or coarse sand may be required to act as a filter between the screen and the aquifer.